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A manual of questions which can serve as a checklist of activities and facility requirements is prepared for those concerned with the design of industrial arts facilities. It is intended to aid teachers, administrators, and architects in establishing functional criteria for new or remodeled industrial arts centers. A complete activity list is included to help teachers determine space and equipment requirements. The manual supplies the architect with data upon which to base appropriate square footage requirements, equipment selection, and activity centers consistent with a particular school's needs. (TG)

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A MANUAL FOR PLANNING
A SECONDARY SCHOOL BUILDING

A. E. Wohlers

Pamphlet C-7

INDUSTRIAL ARTS

EF 003 392

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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The Bureau of Educational Research
The College of Education
The Ohio State University
Columbus, Ohio

Pamphlet C-7

INDUSTRIAL ARTS

Rooms and Spaces Included in This Pamphlet

Teaching stations	11
Auxiliary rooms	29
Summary of rooms and spaces	36

A. The number of teaching stations required for the industrial arts program for various projected enrollments has been calculated in accordance with directions in Pamphlet B-1. Indicate in the space below the calculated number of teaching stations required for the industrial arts program for the enrollment to be housed in the new building.

Number of teaching stations _____

Comments:

B. The rooms for the industrial arts program should be planned according to the number of teaching stations required and the types of activities that will be carried on in the various rooms. Maximum flexibility of use is possible when each space is planned to house many aspects of the industrial arts program.

For certain activities, auxiliary spaces are needed. Early in the planning process, it will be necessary to determine whether these spaces are to be separate rooms closely related to the teaching stations or spaces within the teaching stations. For instance, space for shop instruction or demonstration may be developed as a separate room which may also be used for planning or it may be a space within the shop where folding chairs or workbenches may be used for seating.

C. In this section, (1) indicate the extent to which experiences should be provided in each of the following industrial areas and (2) indicate the extent to which the activities mentioned in each area will be carried on. It is not necessary to consider activities in any area that is not essential for the industrial arts program to be housed in the new building.

When only limited experiences in some of the areas included on pages 2 through 11 are to be provided, such experiences may be included as a part of some related area. For instance, some arts and crafts activities may be included as a part of the woodworking activities.

1. Drawing and planning	1 2 3 N
a. Use and care for drawing instruments	1 2 3 N
b. Do lettering and dimensioning	1 2 3 N
c. Do sectioning	1 2 3 N
d. Read drawings and blueprints	1 2 3 N
e. Do free-hand drawing or sectioning	1 2 3 N

f. Make orthographic, isometric, and other views 1 2 3 N

g. Design projects in metal, wood, etc. 1 2 3 N

h. Do inking and tracing 1 2 3 N

Suggest other activities.

2. Woodwork 1 2 3 N

a. Draw plans and develop layouts 1 2 3 N

b. Layout, measure, and cut general construction pieces 1 2 3 N

c. Use and care for hand tools 1 2 3 N

d. Set up and operate woodworking machines such as

1) Lathe 1 2 3 N

2) Circular saw 1 2 3 N

3) Band saw 1 2 3 N

4) Jointer 1 2 3 N

5) Planer 1 2 3 N

6) Sander 1 2 3 N

7) Shaper 1 2 3 N

8) Other _____ 1 2 3 N

e. Assemble and fasten or glue wooden pieces 1 2 3 N

f. Prepare for and finish various types of woods 1 2 3 N

g. Repair wooden objects 1 2 3 N

Suggest other activities.

3. General metals

a. Machine shop 1 2 3 N

1) Draw plans and develop layouts 1 2 3 N

2) Use and care for hand tools 1 2 3 N

3) Set up and operate metal working equipment such as 1 2 3 N

a) Lathes 1 2 3 N

b) Shapers 1 2 3 N

c) Drill presses 1 2 3 N

d) Arbor presses 1 2 3 N

e) Grinders 1 2 3 N

f) Milling machines 1 2 3 N

g) Power hack saws 1 2 3 N

h) Other _____ 1 2 3 N

Suggest other activities:

b. Sheet metal 1 2 3 N

1) Lay out, measure, cut, and fit simple sheet metal parts 1 2 3 N

2) Form metals to various shapes with machine and hand tools 1 2 3 N

3) Repair sheet metal objects through use of riveting, soldering, and fitting 1 2 3 N

4) Make advanced sheet metal layouts 1 2 3 N

5) Set up and operate sheet metal working equipment such as

a) Shears 1 2 3 N

b) Brakes 1 2 3 N

c) Rotary machines 1 2 3 N

d) Former 1 2 3 N

e) Other _____ 1 2 3 N

Suggest other activities.

c. Bench metal 1 2 3 N

1) Read blueprints 1 2 3 N

2) Use and care for hand tools

3) Set up and operate metal working equipment such as

a) Power drills 1 2 3 N

b) Taps 1 2 3 N

c) Dies 1 2 3 N

d) Other _____ 1 2 3 N

Suggest other activities.

d. Forging 1 2 3 N

1) Cut cold and hot meals 1 2 3 N

2) Taper and draw hot metals 1 2 3 N

3) Shape, bend, and form metals 1 2 3 N

4) Aneal and temper metals 1 2 3 N

5) Use and care for hand tools 1 2 3 N

6) Set up and operate equipment such as

a) Forges 1 2 3 N

b) Furnaces 1 2 3 N

c) Power hack saws 1 2 3 N

d) Grinders 1 2 3 N

e) Drill presses 1 2 3 N

f) Other _____ 1 2 3 N

Suggest other activities.

e. Foundry 1 2 3 N

1) Study elements of foundry operation 1 2 3 N

2) Make patterns 1 2 3 N

3) Prepare molds for casting 1 2 3 N

4) Handle molten metals 1 2 3 N

5) Blast and grind castings 1 2 3 N

Suggest other activities.

f. Welding 1 2 3 N

1) Study welding processes 1 2 3 N

2) Prepare objects for welding and selecting proper equipment and welding supplies 1 2 3 N

3) Operate oxyacetylene cutting and welding equipment 1 2 3 N

4) Operate arc-welding equipment 1 2 3 N

Suggest other activities.

g. Art metal 1 2 3 N

1) Design art metal objects 1 2 3 N

2) Use and care for hand tools 1 2 3 N

3) Set up and operate equipment such as

a) Lathes 1 2 3 N

b) Grinders 1 2 3 N

c) Buffers 1 2 3 N

d) Drill presses 1 2 3 N

e) Other _____ 1 2 3 N

4) Carry on such operations as

a) Annealing 1 2 3 N

b) Oxidizing 1 2 3 N

c) Coloring 1 2 3 N

d) Soldering 1 2 3 N

e) Plating 1 2 3 N

f) Sensitizing 1 2 3 N

g) Enameling 1 2 3 N

h) Other _____ 1 2 3 N

Suggest other activities.

4. Electrical 1 2 3 N

a. Study basic principles of electricity 1 2 3 N

b. Install bell wire, cable, conduit, fixtures. switches, etc. on mock-ups 1 2 3 N

c. Test, service, and repair simple electrical equipment 1 2 3 N

d. Plan, estimate, and carry out electrical installations 1 2 3 N

e. Study electronics and operation of electronic equipment 1 2 3 N

Suggest other activities.

5. Arts and crafts 1 2 3 N

a. Design and make objects from various types of metal, wood, plastics, leather, etc. 1 2 3 N

b. Use and care for hand tools 1 2 3 N

c. Set up and operate equipment such as

1) Grinders 1 2 3 N

2) Jig saws 1 2 3 N

3) Buffers 1 2 3 N

4) Drill presses 1 2 3 N

5) Other _____ 1 2 3 N

Suggest other activities

6. Auto mechanics 1 2 3 N

a. Study operation of gas and diesel engines and related information 1 2 3 N

b. Work on engine, ignition, and other mock-ups 1 2 3 N

c. Service "live cars" 1 2 3 N

d. Repair "live engines, cars," etc. 1 2 3 N

e. Do body and fender repair work 1 2 3 N

Suggest other activities

7. Communications 1 2 3 N

a. Study communications equipment such as telephones, radios, television, etc. 1 2 3 N

b. Carry on experiments with communications equipment 1 2 3 N

c. Assemble radios and other communications equipment 1 2 3 N

d. Perform simple maintenance operations 1 2 3 N

e. Test and repair equipment 1 2 3 N

Suggest other activities.

8. Graphic arts 1 2 3 N

a. Set up and operate equipment such as

1) Lever press 1 2 3 N

2) Proof press 1 2 3 N

3) Platen press 1 2 3 N

4) Veritype 1 2 3 N

5) Linotype 1 2 3 N

6) Other _____ 1 2 3 N

b. Do binding of books and other materials 1 2 3 N

c. Study kinds of type and methods of production 1 2 3 N

d. Check proof 1 2 3 N

e. Cut paper 1 2 3 N

f. Experiment with paper making 1 2 3 N

g. Do linoleum block printing 1 2 3 N

h. Do etching 1 2 3 N

i. Do silk screen printing 1 2 3 N

j. Do wood engraving 1 2 3 N

k. Print school newspaper 1 2 3 N

l. Print school stationery and forms 1 2 3 N

Suggest other activities.

9. Photography 1 2 3 N

a. Study operation of photographic equipment 1 2 3 N

b. Study theory of lighting 1 2 3 N

c. Use cameras and exposure meters 1 2 3 N

d. Take pictures 1 2 3 N

e. Do copy work 1 2 3 N

f. Mix photographic solutions 1 2 3 N

g. Develop film 1 2 3 N

h. Make contact prints 1 2 3 N

i. Make enlargements 1 2 3 N

j. Make slides 1 2 3 N

k. Edit film 1 2 3 N

l. Plan scenarios 1 2 3 N

Suggest other activities.

10. Ceramics 1 2 3 N

a. Design and make ceramic articles 1 2 3 N

b. Study the processes involved in the production of ceramic products 1 2 3 N

c. Use potter's wheel 1 2 3 N

d. Mix clay and other materials 1 2 3 N

e. Do glazing 1 2 3 N

f. Fire products in kiln 1 2 3 N

g. Display pupil projects 1 2 3 N

Suggest other activities.

11. Plastics 1 2 3 N

a. Study processes in developing plastics 1 2 3 N

b. Form, shape, and cast plastic objects 1 2 3 N

c. Design and construct objects from plastics 1 2 3 N

d. Operate equipment such as

1) Jig saws 1 2 3 N

2) Circular saws 1 2 3 N

3) Lathes 1 2 3 N

4) Sanders 1 2 3 N

5) Band saws 1 2 3 N

6) Buffers 1 2 3 N

7) Other _____ 1 2 3 N

Suggest other activities.

D. Industrial arts shops or laboratories fall into three major classifications:

1. General shops which provide for a number of areas of activity in one major room with each activity representing one general industrial operation.

2. General unit shops which provide separate facilities for numerous activities within a specific industrial area such as general metals which includes machine shop, sheet metal, foundry, etc.

3. Unit shops which provide separate facilities for activities found within a specific phase of a single industrial area such as machine shop, a specific phase of the general metals area.

On the basis of information provided in the preceding sections, indicate the types of shops to be provided, the areas of activity to be accommodated in each shop, and the number of each type of shop to be provided.

	Type of shop*	Industrial arts areas to be accommodated in each shop	Number of shops
1.	_____	_____	
		_____	_____
2.	_____	_____	
		_____	_____

(continued)

	Type of shop*	Industrial arts areas to be accommodated in each shop	Number of shops
3.	_____	_____	
		_____	_____
4.	_____	_____	
		_____	_____

*General, general unit, or unit shop

E. For each of the different types of teaching stations needed for the industrial arts program, provide the information requested below. Provisions have been made for four different types of teaching stations. Complete only those portions of the following sections which pertain to the needs of the comtemplated program.

Identify each different type of teaching station needed by indicating the uses for which each is to be designed. For instance, if one teaching station is to be used for general shop and planning activities, record general shop and planning on the line following the item, "Type of teaching station to be planned," in one of the sections which follows; if a second teaching station is to be used for woodworking, record woodworking on the line following the item, "Type of teaching station to be planned," in another section which follows; if a third teaching station is to be used for mechanical drawing, record mechanical drawing on the line following the item, "Type of teaching station to be planned," in another section which follows, etc.

1. Type of teaching station to be planned _____

_____

a. Indicate the industrial areas to be accommodated in this type of teaching station.

b. Number of teaching stations of this type to be planned _____

c. Suggest desired locations for this type of teaching station or suggest factors which should determine the locations.

d. Indicate the approximate number of linear feet of chalkboard and tackboard needed in each teaching station of this type (see directions, Pamphlet C-1).

Chalkboard, _____ linear feet; tackboard, _____ linear feet

Suggest any special considerations such as locations, vertical widths, rulings or etchings, special uses, etc. which the

architect should now to aid in planning the space to be used for chalkboard and tackboard.

e. Furniture and equipment

1) List the types of desk and seating facilities desired and the number of each type needed.

2) List the types of furniture and equipment which will be needed and suggest any special information which the architect should know about the various items to aid in planning.

f. Indicate the extent to which the following types of storage facilities will be used and suggest types, dimensions, and quantities of materials to be stored.

1) Filing drawers
Number of drawers ____, size of drawers _____ 1 2 3 N

Comments:

2) Bookshelving 1 2 3 N
Open shelving, _____ linear feet
Closed shelving, _____ linear feet

Comments:

3) Storage for raw materials 1 2 3 N

Comments:

4) Storage for tools 1 2 3 N

Comments:

5) Storage for instructional supplies 1 2 3 N

Comments:

6) Storage for partially completed pupil projects 1 2 3 N

Comments:

Comments: (Item 6) continued

7) Storage for pupils' personal belongings 1 2 3 N

Comments:

8) Storage for instructors' personal belongings 1 2 3 N

Comments:

Suggest other types of storage needed.

g. Suggest floor area needed for this type of teaching station or suggest factors which should determine the area needed (see directions, Pamphlet C-1).

Square feet _____

Comments:

h. Indicate any additional information which the architect should know to aid in planning this type of facility.

i. In event this type of teaching station is not needed full time for the industrial arts program, what other types of activities are:

   1) Most likely to function well in this type of teaching station?

   2) Least likely to function well in this type of teaching station?

j. In event it is not financially feasible to provide a separate room for this type of teaching station, indicate other rooms or spaces which could be planned to accommodate these industrial arts activities.

2. Type of teaching station to be planned _____

_____

   a. Indicate the industrial areas to be accommodated in this type of teaching station.

   b. Number of teaching stations of this type to be planned._____

   c. Suggest desired locations for this type of teaching station or suggest factors which should determine the locations.

d. Indicate the approximate number of linear feet of chalkboard and tackboard needed in each teaching station of this type (see directions, Pamphlet C-1).

Chalkboard, _____ linear feet; tackboard, _____ linear feet

Suggest any special considerations such as locations, vertical widths, rulings or etchings, special uses, etc. which the architect should know to aid in planning the space to be used for chalkboard and tackboard.

e. Furniture and equipment

1) List the types of desk and seating facilities desired and the number of each type needed.

2) List the types of furniture and equipment which will be needed and suggest any special information which the architect should know about the various items to aid in planning.

f. Indicate the extent to which the following types of storage facilities will be used and suggest types, dimensions, and quantities of materials to be stored.

1) Filing drawers 1 2 3 N
Number of drawers _____, size of drawers _____

Comments:

2) Bookshelving 1 2 3 N
Open shelving, _____ linear feet
Closed shelving,_____ linear feet

Comments:

3) Storage for raw materials 1 2 3 N

Comments:

4) Storage for tools 1 2 3 N

Comments:

5) Storage for instructional supplies 1 2 3 N

Comments:

6) Storage for partially completed pupil projects 1 2 3 N

Comments:

7) Storage for pupils' personal belongings 1 2 3 N

Comments:

8) Storage for instructors' personal belongings 1 2 3 N

Comments:

Suggest other types of storage needed.

g. Suggest floor area needed for this type of teaching station or suggest factors which should determine the area needed (See directions, Pamphlet C-1)

Square feet _____

Comments:

h. Indicate any additional information which the architect should know to aid in planning this type of facility.

i. In event this type of teaching station is not needed full time for the industrial arts program, what other types of activities are:

1) Most likely to function well in this type of teaching station?

2) Least likely to function well in this type of teaching station?

j. In event it is not financially feasible to provide a separate room for this type of teaching station, indicate other rooms or spaces which could be planned to accommodate these industrial arts activities.

3. Type of teaching station to be planned _____

---

a. Indicate the industrial areas to be accommodated in this type of teaching station.

b. Number of teaching stations of this type to be planned _____

c. Suggest desired locations for this type of teaching station or suggest factors which should determine the locations.

d. Indicate the approximate number of linear feet of chalkboard and tackboard needed in each teaching station of this type (see directions, Pamphlet C-1).

Chalkboard, _____ linear feet; tackboard, _____ linear feet

Suggest any special considerations such as locations, vertical widths, rulings or etchings, special uses, etc which the architect should know to aid in planning the space to be used for chalkboard and tackboard.

e. Furniture and equipment

1) List the types of desk and seating facilities desired and the number of each type needed.

2) List the types of furniture and equipment which will be needed and suggest any special information which the architect should know about the various items to aid in planning.

(item 2) continued

f. Indicate the extent to which the following types of storage facilities will be used and suggest types, dimensions, and quantities of materials to be stored.

1) Filing drawers 1 2 3 N
Number of drawers ____, size of drawers ____

Comments:

2) Bookshelving 1 2 3 N
Open shelving, ___ linear feet
Closed shelving, ____ linear feet

Comments:

3) Storage for raw materials 1 2 3 N

Comments:

(Item 3) continued

4) Storage for tools 1 2 3 N

Comments:

5) Storage for instructional supplies 1 2 3 N

Comments:

6) Storage for partially completed pupil projects 1 2 3 N

Comments:

7) Storage for pupils' personal belongings 1 2 3 N

Comments:

8) Storage for instructors' personal belongings

Comments:

Suggest other types of storage needed

g. Suggest floor area needed for this type of teaching station or suggest factors which should determine the area needed (see directions, Pamphlet C-1)

Square feet _____

Comments:

h. Indicate any additional information which the architect should know to aid in planning this type of facility.

i. In event this type of teaching station is not needed full time for the industrial arts program, what other types of activities are:

1) Most likely to function well in this type of teaching station?

2) Least likely to function well in this type of teaching station?

j. In event it is not financially feasible to provide a separate room for this type of teaching station, indicate other rooms or spaces which could be planned to accommodate these industrial arts activities.

4. Type of teaching station to be planned _____

a. Indicate the industrial areas to be accommodated in this type of teaching station.

b. Number of teaching stations of this type to be planned _____

c. Suggest desired locations for this type of teaching station or suggest factors which should determine the locations.

d. Indicate the approximate number of linear feet of chalkboard and tackboard needed in each teaching station of this type (see directions, Pamphlet C-1).

Chalkboard, _____ linear feet; tackboard, _____ linear feet

Suggest any special considerations such as locations, vertical widths, rulings or etchings, special uses, etc. which the architect should know to aid in planning the space to be used for chalkboard and tackboard.

e. Furniture and equipment

1) List the types of desk and seating facilities desired and the number of each type needed.

2) List the types of furniture and equipment which will be needed and suggest any special information which the architect should know about the various items to aid in planning.

f. Indicate the extent to which the following types of storage facilities will be used and suggest types, dimensions, and quantities of materials to be stored.

1) Filing drawers 1 2 3 N
Number of drawers ____, size of drawers _____

(Item 1) continued

2) Bookshelving 1 2 3 N
Open shelving, _____ linear feet
Closed shelving,_____ linear feet

Comments:

3) Storage for raw materials 1 2 3 N

Comments:

4) Storage for tools 1 2 3 N

Comments:

5) Storage for instructional supplies 1 2 3 N

Comments:

6) Storage for partially completed pupil projects 1 2 3 N

Comments:

7) Storage for pupils' personal belongings 1 2 3 N

Comments:

8) Storage for instructors' personal belongings 1 2 3 N

Comments:

g. Suggest floor area needed for this type of teaching station or suggest factors which should determine the area needed (see directions, Pamphlet C-1).

Square feet _____

Comments: (item g, continued)

h. Indicate any additional information which the architect should know to aid in planning this type of facility.

i. In event this type of teaching station is not needed full time for the industrial arts program, what other types of activities are:

1) Most likely to function well in this type of teaching station?

2) Least likely to function well in this type of teaching station?

j. In event it is not financially feasible to provide a separate room for this type of teaching station, indicate other rooms or spaces which could be planned to accommodate these industrial arts activities

F. Indicate the extent to which the following types of auxiliary rooms will be used in the industrial arts program.

1.	Demonstration rooms	1 2 3 N
2.	Conference rooms	1 2 3 N
3.	Library	1 2 3 N
4.	Instructors' offices	1 2 3 N

5.	Planning rooms	1 2 3 N
6.	Finishing rooms	1 2 3 N
7.	Project drying rooms	1 2 3 N
8.	Partially completed project storage rooms	1 2 3 N
9.	Tool rooms	1 2 3 N
10.	Storage rooms	1 2 3 N
11.	Boys' toilet	1 2 3 N
12.	Girls' toilet	1 2 3 N
13.	Washrooms	1 2 3 N

Suggest other types of rooms or spaces needed.

Comments:

G. For each of the auxiliary rooms listed in item F that is needed for the industrial arts program, provide the information requested below. Identify each room by indicating the use for which it is to be designed. In many instances it may be desirable to provide rooms which are to serve more than one purpose. If any rooms are to be planned to serve more than one purpose, identify each one by a phrase which suggests the multiple uses for which it is to be planned--for example, conference room and an instructor's office or finishing and project drying room.

1. Type or use of room to be planned _____

_____

a. Number of this type to be planned _____

b. Indicate the activities or uses for which these rooms should be planned.

c. Suggest desired locations for these rooms or suggest factors which should determine their locations.

d. Indicate types of furniture and equipment to be provided for this type of room.

e. Indicate types, dimensions, and quantities of materials to be stored and type of storage needed

f. Suggest floor area needed or suggest factors which should determine the area needed (see directions, Pamphlet (-1)

Square feet _____

Comments:

g. Indicate any additional information which the architect should know to aid in planning this type of facility.

2. Type of room to be planned _____

_____

a. Number of this type to be planned _____

b. Indicate the activities or uses for which these rooms are to be planned.

c. Suggest desired locations for these rooms or suggest factors which should determine their locations.

d. Indicate types of furniture and equipment to be provided for this type of room.

e. Indicate types, dimensions, and quantities of materials to be stored and type of storage needed.

f. Suggest floor area needed or suggest factors which should determine the area needed (see directions, Pamphlet C-1)

Square feet _____

Comments:

g. Indicate any additional information which the architect should know to aid in planning this type of facility

3. Type of room to be planned _____

_____

a. Number of this type to be planned _____

b. Indicate the activities or uses for which these rooms are to be planned.

c. Suggest desired locations for these rooms or suggest factors which should determine their locations.

d. Indicate types of furniture and equipment to be provided for this type of room.

e. Indicate types, dimensions, and quantities of materials to be stored and type of storage needed.

f. Suggest floor area needed or suggest factors which should determine the area needed (see directions, Pamphlet C-1)

Square feet _____

Comments:

g. Indicate any additional information which the architect should know to aid in planning this type of facility

4. Type of room to be planned _____

_____

a. Number of this type to be planned _____

b. Indicate the activities or uses for which these rooms are to be planned.

c. Suggest desired locations for these rooms or suggest factors which should determine their locations.

d. Indicate types of furniture and equipment to be provided for this type of room.

e. Indicate types, dimensions, and quantities of materials to be stored and type of storage needed.

f. Suggest floor area needed or suggest factors which should determine the area needed (see directions, Pamphlet C-1).

Square feet _____

Comments

g. Indicate any additional information which the architect should know to aid in planning this type of facility.

H. In the space provided below, indicate any additional information about any aspect of the industrial arts rooms or program which the architect should know to aid in planning these rooms. Schematic diagrams or pictures may also be of value to suggest desirable features to the architect.

(Item H, continued)

I. Indicate factors which the architect should take into consideration when planning the general location of the industrial arts rooms in relation to other areas of the building and in relation to outdoor facilities. include factors such as accessibility to other portions of the building, isolation of noises, and accessibility to service drive.

J. Summarize rooms and spaces needed for the industrial arts program.

Type or use of room	Number of rooms	Suggested floor area per room (sq. ft.)	Page in pamphlet
1. Teaching Stations			
a.			
b.			
c.			
d.			
e.			
f.			

(Item J, continued)

Type or use of room	Number of rooms	Suggested floor area per room (sq. ft.)	Page in pamphlet
2. Auxiliary Rooms			
a.			
b.			
c.			
d.			
e.			
f.			